High Resolution In situ Ozone Measurements From the NASA DC-8 During the SOLVE-2 Mission

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Description of Ozone Instrument Features and Capabilities

Our in situ ozone sensors are capable of fast, sensitive ozone measurements over a large dynamic range and a wide variety of atmospheric conditions. The measurements are performed by combining pure reagent nitric oxide (NO) with incoming sample air in a small volume reaction chamber, and by measuring light from the resulting NO_2 chemiluminescence. The reaction chamber is maintained at constant temperature and pressure (25 Torr) by buffering ambient pressure changes with a larger-volume prechamber maintained at 100 Torr. The technique, as adapted for use on aircraft, is described in detail in the references listed below. Sampled air enters the aircraft through a forward-facing, Teflon-lined, J-shaped probe that has been demonstrated to be insensitive to aircraft attitude. Approximately 2 standard liters/minute of air is pulled from RAM flow through the probe, into the instrument prechamber. Finally, sample flow into the reaction chamber is 500 standard cc/minute. The instrument is calibrated by referencing to the NIST standard ozone photometer. Final 1 Hz ozone data from both SOLVE missions will be available from the SOLVE websites. (Our in situ data from SOLVE-1 is already available.) Some instrument specifications are listed below.

Ozone Instrument Specifications

Technique:	Chemluminescent reaction of ozone with nitric oxide
Dynamic Range:	0.8 – 3000 ppb
Accuracy:	5% or 2 ppb
Precision:	2% or 0.8 ppb
Response:	2-3 Hz
Spatial Resolution:	50 m vertical, 200 m horizontal

References

Eastman, J.A. and D.H. Stedman, A fast response sensor for ozone eddy-correlation flux measurements, Atmos. Environ., 11, 1209-1211, 1977.

Gregory, G.L., C.H. Hudgins, J. Ritter and M. Lawrence, In situ ozone instrumentation for 10-Hz measurements: Development and evaluation, Proceedings of sixth symposium on Meteorological Observations and Instrumentation, New Orleans, LA, Jan 12-16, 136-139, 1987.

Pearson R.W. and D.H. Stedman, Instrumentation for fast response ozone measurements from aircraft, Atmos Tech, 12, 1980.